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Book Reviews

The Monocotyledons: a Comparative Study, by Rolf M. T. Dahlgren and H. Trevor Clifford, with pp. 378. London: Academic Press, 1982. ("Botanical Systematics": an occasional series of monographs, edited by V. H. Heywood). US$ 98,00, £48,00. ISBN 0–12–200680–1.

The familial and ordinal classification of the flowering plants has always been a complex problem fraught with the difficult questions of homology, convergence and character significance. Nevertheless the search for better and more natural schemes continues. And with time more and increasingly diverse kinds of data have become available to be applied to the problems of classification. At the same time the difficulties of assembling, assimilating and interpreting the great quantities of data are compounded. Rolf Dahlgren and Trevor Clifford have produced in this book a remarkable effort at presenting much of the available data that can be brought to bear on systematic problems for the monocotyledons and synthesizing it into a coherent whole in the form of a revised scheme of classification for the monocots.

Data of systematic value have been brought together from innumerable sources and condensed into a form that the reader can digest. The larger part of this impressive work is a survey of the "distribution of selected characters and their states". Some 100 characters are dealt with, most of them accompanied by appropriate illustrations, and their occurrence is plotted on bubble diagrams of those orders of the monocots which the authors recognize in their classification scheme, presented in an earlier chapter. In these diagrams, introduced and used by Dahlgren in a series of publications on plant phylogeny and classification, the bubbles represent the orders of monocots arranged spatially to indicate in a simple way, broad evolutionary relationships.

A wide variety of characters are dealt with including traditional organ morphology (e.g. ovary position, ptyxis, venation patterns); as well as anatomy (e.g. laticifers, stomata structure and origin, vessel shape); embryology (e.g. pollen morphology, tapetum types, ovule structure, placentation); chemistry (e.g. steroid saponons, cyanogenic compounds, flavonols and flavones); and a selection of less unorthodox features such as fine structure (sieve tube plastid bodies); and host specificity (e.g. plant lice, various fungi).

A fundamental paradox, common to systematic studies in general, is that a system of classification is developed by the evaluation and synthesis of data, and then the classification is used to present and discuss this data. Although this may seem self serving, it is the most efficient way to present and deal with systematic situations. To be fair, the authors present a thorough historic review of monocot classification before developing their own. One of the outstanding features of the Dahlgren–Clifford classification is their treatment of the order "Liliales" in its current broad sense, and it is this aspect which will have most impact on southern African systematists. This is broken down into several orders, the fundamental division being the separation of Asparagales from Liliales as well as the recognition of Burmanniales, Orchidales and isolated small orders like Haemodorales, Velloziales, Philydrales, and Bromeliales. Within Asparagales, united especially by the frequent presence of a black, phytomelan seed crust, are several families not often accorded this status including some important in Africa like Asparagaceae; Dracaenaceae; Amaryllidaceae (here not including Alliaceae); Tecophilaeaceae; Hyacinthaceae (Scilloideae); and Asphodelaceae (Anthericoideae). Apart from a now relatively small North Temperate Liliaceae (14 genera), Liliales comprises Iridaceae (the largest), Colchicaceae (Wurmbaeaoideae) and some non-African families, importantly Melanthiaceae, also largely North Temperate.

Many of the families accorded recognition here have most often been included in a large, very diverse and heterogeneous "Liliaceae" in the past, sharing little except a generalized petaloid monocot ground plan. The system presented here is one of several developed in the last few years and it will take time for a consensus to evolve on which is the most useful, practical and correct (if any one system fulfils all these requirements). The Dahlgren–Clifford system seems to be for the most part, a natural scheme and the most acceptable one so far developed and it is certainly the most fully documented classification for the monocots yet presented. Despite this, it will take many years before the system or a modification of it will be accepted. Such is the conservative and traditional bias in plant systematics.

An interesting section near the end deals with the vexing question of the relationship of the monocots to the dicotyledons. There are several current hypotheses dealing with the problem, all reviewed by Dahlgren and Clifford, who favour the idea that Dioscoreales are close to the basic monocot stock and that this group has its closest affinities with Aristolochiales. This in turn is close to the basal magnolioid lines that comprise the most primitive of the living dicots. This runs counter to the more widely favoured theory that the aquatic monocots, Alismatales sens. lat. are the most primitive monocots and that they are allied to the dicots through the Nympheales.

This book is a model of its kind in plant systematics and no botanical library can afford to be without it. It will be a valuable teaching aid, a useful reference for senior students as well as a fine research resource for systematists.

PETER GOLDBLATT

PLANT CARBOHYDRATES I: INTRACELLULAR CARBOHYDRATES, edited by F. A. Loewus and W. Tanner, with pp. xxii + 918 and 103 figures. Berlin, Heidelberg, New York: Springer-Verlag, 1982. Cloth, approx. US $132,40. ISBN 3–540–11060–7.

This 1 840 g work represents volume 13A of the New Series of the well known and much appreciated "Encyclopedia of Plant Physiology". Together with *Plant Carbohydrates II,* it replaces the single volume of the original "Encyclopedia of Plant Physiology" which in 1958, adequately summarized the state of our knowledge about plant carbohydrates at that time.

This volume provides a comprehensive assessment of our current knowledge of the carbohydrates which usually do not occur outside the plasmalemma of living plant cells. For convenience, all organisms except animals and bacteria are regarded as plants and the treatise deals with the carbohydrates of fungi and algae in addition to those occurring in mosses, ferns and seed plants.

In contrast to what some might have expected, the emphasis throughout the book is on the physiological activity and metabolic involvement of the various carbohydrates rather than on their chemistry—as indeed befits a volume of an "Encyclopedia of Plant Physiology".

The 21 chapters which have been written by 62 well-known experts, are arranged in three sections. The first deals with the occurrence, metabolism and functions of the monosaccharides and oligosaccharides and related compounds. Special treatment is given to sucrose and related oligosaccharides, as well as to the uronic acids, amino sugars, branched-chain sugars, sugar alcohols, cyclitols and heterosides (glycosides).

The second section deals with the occurrence, metabolism and function of those macromolecular carbohydrates which occur intracellularly, i.e. starch and other reserve polysaccharides, glycoproteins, glycolipids and steryl glycosides. Because of the importance of glycoproteins as lectins and as constituents of plasmamembranes, two chapters are devoted to this important class of compounds.

In the third (final) section five chapters are devoted to purely physiological aspects of carbohydrates: the translocation of sugars; the secretion of nectar; the storage of sugars in higher plants; the storage of starch; and the control by external and internal factors over the mobilization of reserve carbohydrates in higher plants.

The recommendations of the International Union of Pure and Applied Chemistry (IUPAC) regarding carbohydrate nomenclature, the rules of the International Union of Biochemistry (IUB) on oligosaccharides and polysaccharides and the recommendations of the IUPAC-IUB Commission on Biochemical Nomenclature were adhered to throughout.

This monumental work will no doubt become a standard reference work on plant carbohydrates for several years. It is clearly written and well illustrated. The many references at the end of each chapter are especially useful because the full titles of the papers and the lengths of the papers cited are provided in all cases. Apart from the usual subject index, an author index and a species index are also provided.

N. GROBBELAAR

PLANT CARBOHYDRATES II: EXTRACELLULAR CARBOHYDRATES, edited by W. Tanner and F. A. Loewus, with pp. xxii + 769 and 124 figures. Berlin, Heidelberg, New York: Springer-Verlag, 1981. Cloth, approx. US $124,80. ISBN 3–540–11007–0.

This book represents volume 13B of the New Series of the authoritative "Encyclopedia of Plant Physiology" which has become a standard reference work on plant physiology. It deals with those carbohydrates and related compounds which are secreted by the protoplasm of plant cells and therefore usually occur outside the plasmalemma of such cells.

The carbohydrate components of the cell walls of fungi, algae and seed plants are dealt with in considerable detail. This is necessitated by the relatively recent discovery of the importance of carbohydrates in cell-cell surface interactions and recognition systems. Thus host-parasite and pollen-pistil interactions as well as symbiosis and the mating reaction in fungi are but some of the complex but fascinating physiological phenomena in which extracellular plant carbohydrates play key roles.

The book contains 26 chapters which have been written by 38 recognised experts in their respective fields. The chapters are grouped into five sections and the first, which deals with the cell walls of higher plants, contains no less than 11 chapters. They cover the constitution of the cell wall polysaccharides; the biophysical as well as the biochemical ultrastructure of the cell wall; the assembly of polysaccharide fibrils; the biosynthesis and metabolism of cellulose and noncellulosic cell wall polysaccharides; the glycoproteins and enzymes of the cell wall; the role of lipid-linked saccharides in the biosynthesis of complex carbohydrates; the biosynthesis of lignin, cutin, suberin and associated waxes: and finally the effect of hormones on cell wall extension.

Section two is devoted to the cell walls of algae and fungi—their composition, biosynthesis, cytology and degrading enzymes (autolysines)—eight chapters. The three chapters of section three all deal with secretion—especially as it occurs in fungi, the root cap of seed plants and in cell wall formation during cell division.

Sections four and five are probably the most topical. They deal with cell wall surface phenomena including lectin-carbohydrate interactions (2 chapters each). The involvement of carbohydrates in pollination and plant-pathogen interactions is discussed in section four. In the last section the physiological role of lectins in slime moulds and higher plants and in symbiotic plant-microbe interactions are discussed.

The presentation of the material, although encyclopedic, is excellent. It reads easily and is quite lucid and well illustrated. The references at the end of each chapter provide the full title and length of each publication. Apart from the subject index, an author index is also provided. A species index is, however, not included.

Because this volume deals with the more novel aspects of plant carbohydrate physiology, it is bound to become outdated sooner than Volume I. It is nevertheless a must for each University Botany Department and plant physiological research establishment and will no doubt be used as a standard reference work for several years to come.

N. GROBBELAAR

GROWTH AND DIFFERENTIATION IN PLANTS, by P. F. Wareing and I. D. J. Phillips, with pp. xi + 343. Oxford, New York, Toronto, Sydney, Paris, Frankfurt: Pergamon Press, 1981. US $20 (F), $40 (H). ISBN (F) 0–08–0263–510.

The third edition of Wareing's and Phillips' plant physiology textbook shows few differences from the second. The title has been shortened, some references added, the chapters organized into four sections, and each section preceded by a brief introduction. The chapter sequence, however, has been maintained. The heading of the last chapter has been changed from "The Control of Development" to "Gene Expression and Cell Determination in Development" and in the process the treatment of polarity moved to the first chapter "The Plant Cell in Development". New information added to this chapter includes that on the cell cycle and secondary wall formation.

The third edition has undergone a 25% increase in surface size without a corresponding increase in information, unfortunately making it a less wieldy book than its predecessor. The micrographs, generally, have been poorly reproduced (examples: Fig. 1.10, p. 12; Fig. 2.3, p. 24); some are clearer than the corresponding ones in the 2nd edition, but others are poorer by comparison (example: Fig. 2.5 B—designated b on the photograph—p. 25). Some graphic reprintings, compared with the original publications, have lost definition (examples: Fig. 9.1, p. 218; Fig. 11.1, p. 261); many line drawings and chemical configurations lack boldness (examples: Fig. 2.18, p. 38; Fig. 4.3, p. 79) and on some the lettering and symbols are too small and faint (example: Fig. 5.31, p. 140). There is, furthermore, much wasted space (some examples: pp. 32, 103, 116, 130, 166); space which could for example have been utilized to increase magnification of photographs, graphs and line drawings. As compared with an American or German botanical textbook I would have to judge the general design and layout as inferior.

Despite the overall inexcellence of the book's production, there is much to commend it. Dealing only with growth and development, it is not a general plant physiology text, but one that should be able to treat this complex discipline with authority. This, as is to be expected from Aberystwyth, certainly is the case in respect of the two central sections covering internal and environmental controls of development. The chapter on growth movements, in particular, has been expanded and greatly improved. The book is extremely readable, as up-to-date as one can expect a book of this nature to be (although I found no reference to Skoog's *Plant Growth Substances*, 1979), and displays a fresh perspective by relating phenomena under discussion to the experiments used in their investigations. It is a good teaching text.

To soften the comments made above about the illustrations: a reviewer in *Nature* (1982) pointed out the transformation which the flowering test-tube *Primula* underwent on the 3rd edition's cover page. The artist certainly has made it represent plant growth and development much more colourfully than was the case with its predecessor on the cover of the 2nd.

CHRIS H. BORNMAN

EXPERIMENTS IN PLANT TISSUE CULTURE, by J. H. Dodds and L. W. Roberts, with xiii + 178. Cambridge, London, New York, New Rochelle, Melbourne, Sydney: Cambridge University Press, 1982. £7,50. ISBN 0–521–23477–8 (hard cover); 0–521–29965–9 (paperback).

Although the number of books on plant tissue culture has increased dramatically over the past decade, few have dealt explicitly with methodology. One of the first was R. A. de Fossard's excellent, inexpensive and comprehensive *Tissue Culture for Plant Propagators* (The University of New England Printery, Armidale, Australia, 1976), and another the expensive, far less comprehensive *Plant Tissue Culture: A Laboratory Manual** by Reinert and Yeoman (Springer-Verlag, 1982). Now there has appeared (1982) a book that is packed with information and one that takes an approach which is different compared with the firstmentioned two.

The book under review comprises 14 chapters and is furnished with author and subject indexes, as well as lists of terms and commercial sources of supplies. Chapter 1 gives an interesting account of the history of plant tissue culture up to the present day. Chapters 2 and 3 treat the problems of aseptic techniques and culture media, repectively. Chapters 4 to 13 involve experiments that demonstrate the use of plant organ, tissue, cell and protoplast cultures as research tools. The final chapter is on a much neglected aspect of plant tissue culture, namely quantitation of procedures.

A useful feature of the book is the organization of each chapter. It begins with a brief historical background, the development of the problem, and a statement of purpose; then comes a list of materials required, a description of the procedure and results, and a number of questions for discussion; and finally, there follows an appendix with additional experiments and techniques, and a list of selected references.

It is obvious that the authors (JHD—a young, gifted and progressive plant biologist and LWR—well-known and respected for his book *Cytodifferentiation in Plants. Xylogenesis as a Model System:* Cambridge University Press, 1976) with this book will reach an audience that includes researchers from a variety of botanical disciplines, in addition to the undergraduate and advanced level high school students for whom it was intended. It goes further than being merely a laboratory textbook; it is also a useful source to most of the major studies that have high-lighted the development of plant tissue culture.

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*Reviewed on page 317 of this issue.

Some errors, not all typographical (*Haplopappus gracilus* instead of *gracilis* in the index), have crept into the book. Examples: The generic name of tomato is spelt *Lycopersicum*, instead of *Lycopersicon*, throughout the book (also in the reference to Padmanabhan, p. 87). Sugar beet, *Beta vulgaris* is said (p. 124) to have a tuber, instead of a fleshy hypocytol-root. The major shortcoming of the book is to be found in chapter 10 on the isolation, purification and culture of protoplasts. Reference could have been made here to the eminently more elegant techniques of J. F. Shepard and colleagues. Also, the dismissal of plant regeneration from protoplasts with a single short paragraph will certainly convey the false impression that it is but a few easy steps, when in fact it is very problematical indeed. Further, it surely is also Widholm (1972) and not only Larkin (1976) who deserves credit for assessment of viability using fluorescein diacetate.

Experiments in Plant Tissue Culture is a well-produced and highly informative textbook and one that is destined to be widely used.

CHRIS H. BORNMAN

PLANT PHYSIOLOGY, by I. P. Ting, with pp. ix + 642. Reading (Massachusetts), Menlo Park (California), London, Amsterdam, Don Mills (Ontario), Sydney: Addison-Wesley Publishing Company, 1982. US $27,95. ISBN 0 201 07406 0.

Yet another relatively high-priced plant physiology text! What novel features might it offer? This question is not easily answered.

Much attention has been devoted to design. The subject matter of the 21 chapters has been divided variously over five parts. Each part's title is announced separately on a page in enormous headlines, below which there are what is referred to as "chapter opening photographs", one photograph for each chapter that follows. Part II, with six chapters, has six slim chapter opening photographs squeezed alongside each other. Each photograph, but now magnified 3×, reappears again with the introduction to the chapter. Following the page that announces the part, is a one or two page "prologue" which serves as a summarized introduction of the chapters comprising the part. The part is concluded by a "prospectus", a page or two that briefly reviews hypotheses, indicates the current state of research, and speculates briefly on future trends. The chapter opening photographs in reality have little if any bearing on the chapters, and are obviously intended to attract and hold the reader's attention, as are the bold black lines that run across the pages underlining chapter subheadings. These features, unfortunately, detract from rather than add to the quality of the book.

The five parts are:

(1) *Structure and function of cells and tissues.* This is an elementary introduction of plant cell (and tissue) structure and function which follows a prologue in which the author expresses the view that the concept of "structure-function is somewhat dangerous because it tends to lead to teleological interpretation".

It is understandable that liberal use was made of light and electron micrographs supplied by colleagues from institutions on the same campus (UC Riverside). However, a number of the photographs by no means represent the best illustrative material available (example: Fig. 1.11, vacuole-extruding protoplasts). The information on plant classification could better have been omitted. The author refers to the groups, divisions, orders and classes listed in Tab. 1.2 as species.

(2) *Biophysical processes: exchanges with the physical environment,* (3) *Biochemical constituents of plants* and (4) *Metabolic processes of plants*. These three

parts form the bulk and heart of the book, making up for lack of depth by the breadth of their coverage.

(5) *Growth and development: integrative processes.* Like part 1, this final section is elementary. It can at best be regarded as a quick, simplified scan of a discipline which the author (in the prospectus) regards as the most complex of plant physiology.

In particular, growth movements, the concepts of morphogenesis, differentiation and determination, and the plant hormones and growth regulators have been accorded shallow treatment.

It is difficult to judge to whom the book is addressed. If it is the undergraduate, it would seem that an introductory text such as *Biology of Plants* (Raven, Evert and Curtis: Worth) would be a superior choice, for in addition to physiology it also embraces the other disciplines of botany. If it is the graduate, there are more meticulous (*Lehrbuch der Pflanzenphysiologie*—Mohr and Schopfer: Springer), comprehensive (*Plant Physiology*—Salisbury and Ross: Wadsworth), scholarly (*Plant Physiology*—Thomas, Ranson and Richardson: Longman) and readable (*Plant Physiology*—Bidwell: MacMillan) textbooks available.

CHRIS H. BORNMAN

PLANT CELL AND TISSUE CULTURE: A LABORATORY MANUAL, by J. Reinert and M. M. Yeoman, with pp. 83. Berlin, Heidelberg, New York: Springer-Verlag, 1982. US $22. ISBN 3 540 11316 9.

As indicated in the title, this book is a laboratory manual. It is aimed at students and others who are inexperienced in the techniques of plant tissue culture. The authors state clearly that there was no pretence of sophistication and that the experiments can be carried out with a minimum of facilities.

Altogether 17 experiments have been selected, from the simple establishment of callus to the more complex isolation and culture of leaf protoplasts, and arranged in six groups. The first set (Part II) of four deal with excision and explantation of tissues and the initiation of cultures, that is cell division and growth. Still dealing with cell division and growth, Part III includes two bioassay experiments for kinetin. Part IV covers morphogenesis and its four experiments illustrate plant regeneration *in vitro* via somatic embryogenesis from cell cultures and immature microgametophytes, from callus tissues, as well as from pseudobulbs. In Part V there are two experiments on the isolation, culture and fusion of protoplasts, and two in Part VI on secondary product synthesis. The last part (VII) includes three experiments on embryo and organ culture.

Obviously, scores of additional experiments covering a wider range of agronomic, ornamental, floral and vegetable plants could have been included; or, alternatively, one or two experiments demonstrating epigenesis (habituation, for example) or mutational changes might have added some zest and challenge to the objectives. However, since the authors made their intent quite clear in their introductory remarks, one should be grateful that a few plants other than the two classic, overworked models of carrot and tobacco also feature in this volume's contents.

The experiments are presented clearly and concisely and are all relatively easy to carry out. However, the methods described for the isolation of mesophyll protoplasts are no longer used by anyone seriously interested in protoplast isolation, culture and plant regeneration, as they involve some time-consuming operations as well as sedimentation of the protoplasts by centrifugation. Missing, too, is information on the use of stains and other methods to ascertain not only the viability of the protoplasts, but also the presence of subprotoplasts (cytoplasts, vacuoplasts, microplasts) so that plating densities can be compensated for.

The layout uses an interesting approach even though it is reminiscent of that found in some modern cookbooks. The items required for an experiment are diagrammatically depicted in a box titled: "Items for the sterile transfer room". The items themselves are numbered, the numbers corresponding to the same listed under Materials and Equipment. So, for example, if a scalpel is listed sixth, it is found boxed in below and identified with the number 6. However, in succeeding experiments this item may have the number 5 or 7 or 11, and so forth. It would in my opinion have been better to present the layout in the transfer room only once, with all the items for all experiments boxed-in and numbered. The number would then have served the purpose also of permanent identification and the space of 18 boxes (ca. 2 500 cm^2) would have been conserved. As it is, 16 of the book's 83 pages are virtually blank, making it, at US $0,33 per page, a very expensive book indeed. Compare this with the average price of US $0,11 per page of technical books in the natural sciences reviewed in *Science* (79: 47, 1983) for the year 1982. As far as being aimed at the inexperienced student, it can be reasonably predicted that this manual is destined for the copying machine.

(The book suffered the unfortunate fate of being recalled by the publisher, after it was discovered that the Index was incorrect.)

CHRIS H. BORNMAN

SALINE AND SODIC SOILS, by E. Bresler, B. L. McNeal and D. L. Carter, with pp. x + 236 and 78 figures. Berlin, Heidelberg, New York: Springer-Verlag, 1982. Cloth DM 98, approx. US $43,60. ISBN 3-540-11120-4.

This book is another in the Springer-Verlag "Advanced Series in Agricultural Sciences", and conforms to the general format and quality of the series. It is well written with very few errors, and is usefully illustrated.

The book is in three approximately equal parts: 1. Diagnosis and Properties; 2. Transportation and Distribution of Salts; 3. Management.

Diagnosis and Properties deals with the sources of salts, some water quality and soil solution parameters, surface phenomena of salt-affected soils, salt dissolution and precipitation and the diagnosis of salinity properties. In general this section is comprehensive and well written, though more attention could have been given to the origins of sodic soils. A sample of saline and sodic soil forming minerals are mentioned but, for example, the sodic soils in granite areas where the granite contains albite (common in south-central Africa) are not included. The theoretical treatment of the exchange equilibria and other aspects of deposition, etc., is detailed and well illustrated.

The section on transportation and distribution of salts is comprehensive but will be difficult to follow for the average biologist who is not very numerate. The sixty pages of Section 2.3 (Modelling of Salt Flow Phenomena) are mostly beyond the needs and comprehension of botanists.

The final 45 pages on Management are interesting and of practical value, and written in a simple, easily understood style. Tables 15–18, which detail the relative productivities and salinity thresholds of a number of crop types, from sensitive to tolerant, under a range of increasing soil salinities, is a particularly useful reference. So, too, are the final sections on reclamation and specialized management practices.

I doubt that the book will become part of the average botanist's personal library, but I strongly recommend its inclusion in all general libraries. Although the examples are mostly American, the general principles apply universally and it will be an important reference and text for research workers in soil science, crop production and general plant/soil relationships.

B. H. WALKER

EXPERIMENTAL EMBRYOLOGY OF VASCULAR PLANTS, edited by B. M. Johri, with pp. 273 and 81 figures. Berlin, Heidelberg, New York: Springer-Verlag, 1982. DM 98, approx. US $43,60. ISBN 3–540–10334–1.

During the past decade a large number of books have been published which dealt with the general field of tissue culture. In view of this, it is only natural to question whether the publication of the current volume was necessary? In view of the rapid advances which have been made in the field of experimental botany this book is entirely justified, more so, as it is intended as a brief and concise account of some of the more recent developments in this rapidly changing field. The book is aimed towards the undergraduate and postgraduate student. As such it was emphasized by the editor that no exhaustive literature reviews have been included. This does not detract from the various chapters which in the reviewer's view contain more than sufficient literature to stimulate the curiosity of young prospective students.

The book consists of a general introduction and nine other chapters which cover a wide spectrum of topics. They include: experimental embryology of pteridophytes; experimental embryology of gymnosperms; flower culture; anther culture; ovary, ovule, and nucellus culture; pollen-pistil interaction and control of fertilization; endosperm culture; embryo culture and protoplast culture. All chapters give a brief review of the literature and then concentrate on some of the more recent discoveries and developments in the respective fields under discussion. Throughout a fairly critical approach has been adopted. Attempts were made to give impetus to future research by the identification of some of the problems which have been encountered in some fields of study.

The volume is neatly presented and the printing and figures are of a high quality. The book is reasonably priced and should be on the shelves of all teaching and research institutions.

J. VAN STADEN

HISTORICAL PLANT GEOGRAPHY, by Philip Stott, with pp. 151. London: George Allen & Unwin, 1981. R16.60. ISBN 0–04–580010–3; 0–04–580011–1 (pbk.)

The saying that a geographer has to be a scientific Jack-of-all-trades finds its confirmation in this concise book of 151 pages. Mr. Stott has brought a complicated branch of botanical science in all its ramifications to the student as well as to the interested layman. The book starts with a discussion on the suitable selection of study areas whether limited to species or genus levels or a continent-wide family level (Chapter 1). In Chapter 2 the importance of correct taxonomy, based on reliable annotated collections and well-prepared herbarium material, is duly stressed. The discussion of the term "type" on page 21, however, could have been clearer. The last section on advanced methods should perhaps have been transferred to Chapter 3 which dwells on the methods applied in the production of plant maps and the selection of the best suitable projections. Although great importance is laid on a show of the selected projection and of a bar scale, some of the map examples should also have shown at least one latitude and longitude, especially on maps of remote regions, as for instance figure 3.6 on page 40.

Chapter 4 deals with patterns of distribution based on the floristic elements of the various distribution types in the world. The use of the word territory on page 47 is somewhat misleading as in zoology the terms denotes an area which is defended by an animal against others of the same species. Chapter 5 investigates the reasons behind the various distribution patterns. The author delves into the multiplicity of a number of ecological phenomena to arrive at conclusions on the origin of distributions and their boundaries, based essentially on the autecology of the species in question. In this connection he quotes Holland's "An evolutionary biography of the genus *Aloe*" (J. Biogeog. **5**, 213–226) as an attempt to find the centre of origin for the genus. In principle this may be sound enough, although I feel that the taxonomy of this genus is in need of revision, particularly that of the sessile and shortstemmed maculate group where systematic sampling would almost certainly reveal clinal phenomena with consequent reduction in the number of species, especially in the epicentre of distribution in the Transvaal.

Well represented is the section dealing with the disruptions of distribution by the drift of the continents in the wake of plate tectonics and sea floor spreading. A few more examples of species affected by these geological events would have been welcome. The section on climatic changes in the past is a little too brief. However, the train of thought is continued in Chapter 6 where the full importance of macro- and microfossils, especially that of pollen analysis, is emphasised.

Chapters 7 and 8 on disjunct distribution patterns and the endemism problem are very clear and well represented, although some of the evidence, for instance plate 7,1 dealing with the distribution history of the Proteaceae which is linked to plate tectonic events, could already have been brought in in Chapter 5. Later the problems of vicariousness and speciation under isolation are discussed. Island and high mountain populations are explained. In Chapter 9 the author dwells on the future influence of cyto- and chemotaxonomy on plant geographical methods. Although these disciplines are becoming increasingly in the mode, it should be emphasised here that their techniques are to be considered more as an aid to taxonomy and systematics rather than the end product. If too vigorously applied, their final effect on taxonomical terms such as species, subspecies and varieties by the creation of a multitude of hybrids might be rather disconcerting and impractical if taxonomical keys designed for botanists in the field are based thereon.

In conclusion, I would state that this is a very readable book couched in easily understandable scientific language and well illustrated by drawings, diagrams and tables. The cover, more suitable for a history of taxonomy, is somewhat unattractive. The layout is good, the price reasonable. All interested in this fascinating subject, whether students or laymen, should try to read this book

N. H. G. JACOBSEN

NEW PERSPECTIVES IN WOOD ANATOMY, edited by Pieter Baas, with pp. vi + 252. The Hague: Martinus Nijhoff Publishers BV, 1982. Dfl. 130, approx. US $54,00. ISBN 90–247–2526–7.

For over 50 years the International Association of Wood Anatomists has championed the scientific study of wood structure. The society and its many distinguished members have made important contributions to investigations of wood anatomy. Especially noteworthy among the achievements are the standardization of wood terminology, the publication of scientific articles on wood structure and function, the encouragement for developing a worldwide network of repositories for vouchered wood samples and wood microslides, and the establishment of a spirit for free exchange of specimens and knowledge around the world, both in basic and applied areas. Over most of its history, publications of IAWA have covered many subjects, but especially many systematic topics and regional surveys of wood, so on their 50th anniversary one might have expected a book summarizing these achievements.

Instead, IAWA once again demonstrated leadership by producing *New Perspectives in Wood Anatomy* (P. Baas, ed.), a commemorative volume on the latest techniques and interesting avenues of research for wood analysis. The nine chapters are extended versions of invited papers presented at the 1981 anniversary gathering at the International Botanical Congress in Sydney, Australia by leading authorities on wood study.

The book begins with a chapter on the early history of IAWA as reconstructed by W. L. Stern from publications, private correspondence, and personal sleuthing. Not only is this an excellent and lucid account of the actual events and controversies, but also here one gains a real flavour for the personalities of S. J. Record, L. Chalk, and B. J. Rendle, the founders of IAWA and the principal pioneers charting its early course. Such an account will be treasured by present and future anatomists, who cannot obtain this valuable historical perspective in our modern educational setting.

Much wood research has asked the question, "Why are woods similar or different?" Naturally, workers have searched diligently for the answers, cautiously hoping that similarities might help solve taxonomic and phylogenetic problems. In Chapter two, P. Baas briefly narrates this search, beginning with the earliest anatomists, and the author presents a new perspective on Antoni van Leeuwenhoek, who has not been given adequate credit for his descriptions and illustrations of wood.

As investigators studied more woods, they became cautiously optimistic that wood structure would help to classify taxa, but eventually they had to adopt the conclusion that wood anatomy is no more dependable than many other features—good systematics must carefully evaluate wood features along with all other comparative evidence. Baas mentions the Baileyan (phylogenetic) trends in wood evolution only briefly because this is pre-empted by several excellent reviews; however, the author does emphasize the important but now well-known caveat that many trends are reversible under certain conditions, a fact of which I. W. Bailey himself was aware and encouraged in the 1960's. Most of the chapter is devoted to "ecological wood anatomy," resurrected by S. Carlquist in the 1960's. Here investigators attempt to understand why woods change, in relation to what ecological factors. Unfortunately, Baas, like others, presents no concrete answers, only narratives based on broad studies using the correlation approach. Data can be assembled to suggest this trend or that one, but, in fact, the answers will come when anatomists analyse how plant phenology, whole plant physiology, and growth habit, not merely habitat, are linked to wood structure. This chapter could have been more lucidly written.

In the next chapter, M. H. Zimmermann discusses one aspect of the relationships between wood structure and physiology, hydraulic conductance. Much of this information has been published before, but this is a useful review. However, the author has also made an important contribution by emphasizing the importance of studying vessel length, whereas wood descriptions based on sections and macerations always emphasize vessel-element length.

Chapter four is a fascinating review by the skilful electron microscopists B. G. Butterfield and B. A. Meylan of the very recent research on formation of perforation plates in vessels. Anatomists will appreciate the detailed discussions on hydrolysis of cell wall components and still marvel at the mystery that hydrolysis degrades some parts of the cell wall more than others. Even in this last part of the 20th century, we have not yet elucidated the final stages in vessel pore formation!

The two following chapters are excellent accounts of the origin of the vascular tissues. In his characteristic style, P. R. Larson deliberately and cautiously traces the origin of procambium and eventual development of cambium. Although the author probably did not have to reiterate the early stages of procambium in embryos, he clearly and expertly showed how the transition from procambium to cambium is a continuum. Specialists on plant structure have recognized this for a long time, but the point must be thrust forward because beginning students are still accustomed to thinking that primary and secondary growth are discrete and definable. Next G. P. Berlyn reviews the most recent information on developmental and morphogenetic events in the cambial zone. So much needs to be learned about the impact of morphogenetic factors on the cambial initials and derivatives, and Berlyn's chapter gives leads for future research.

Every wood anatomist is well aware that wood samples can vary tremendously, depending on the place and climate of collection but also upon differences among individuals in a single population or position within a single plant. These sources of variability are discussed by J. Burley with the goal to provide wood technologists with knowledge for screening specimens in breeding programs. The techniques described should help workers identify genetically superior woods and save much time in trial-and-error research.

In a similar vein, a chapter by Burley and R. B. Miller shows how statistics and computers are becoming indispensable in wood studies. In the future, much data-capturing on wood dimensions, including the storage and retrieval of measurements, the development of dichotomous keys, and the identification of unknown specimens, will be accomplished by computers.

Perhaps the most difficult chapter to digest is by J. D. Boyd, which attempts to model the effects of physical stresses on layers of microfibrils in wood fibre cell walls. Unfortunately, most wood anatomists are not trained in biophysics, so the results will have a narrow audience. Nevertheless, the subject is especially important to wood technologists and wood breeders. Other models are needed to describe how physical stresses affect the wood characteristics and growth habits of living trees, so that we may eventually explain the numerous wood fibre designs in the secondary xylem of dicotyledons.

Overall this volume is attractive and pleasant to read. Its subject is universally applicable to those doing research on wood. Especially laudable is the long list of literature following each chapter. Unfortunately, the high price of this thin book will probably limit its distribution to libraries and to those researchers working directly in areas that are covered.

ARTHUR C. GIBSON